PATENT COOPERATION TREATY

PCT

REC'D 13 JUN 2005
WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference DAS AJEE KAM	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/IN 03/00167	International filing date *(day/month/year)* 22.04.2003	Priority date *(day/month/year)* 22.04.2003
International Patent Classification (IPC) or both national classification and IPC F01C1/067		
Applicant KAMATH, Das Ajee		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05.07.2004	13.06.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Kapoulas, T Telephone No. +31 70 340-2237

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IN 03/00167

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-14 as originally filed

Claims, Numbers

1-8 received on 08.03.2005 with letter of 08.03.2005

Drawings, Sheets

1/29-29/29 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-8
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-8
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following document:
D1: US 2673027 A

The document D1 is regarded as being the closest prior art to the subject-matter of independent claim 1. This document describes a rotary compressor comprising a pair of vanes radially fitted on adjacent hollow coaxial sleeves rotating around a shaft passing through and protruding out of the adjacent sleeve ends, the vanes performing a sequence of operations by alternatively and sequentially being held stationary and rotated simultaneously or independently within a hollow enclosure by means of timing devices including cams and associated linkages and braking arrangements.

The subject-matter of claim 1 differs from this known D1 in that the said cams are mounted on the sleeves and they define a variable initial angular position of the vanes at the start of sequence of operation resulting in the said apparatus functioning with a variable compression ratio. With these features the claimed apparatus can be small in size, can have a smoother operation and can function with different gas cycles.
These features are in combination not obvious from the revealed state of the art.

Hence claim 1 meets the requirements of Article 33 PCT with respect to novelty, inventive step and industrial applicability.

Claims 2-8 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Notes:

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

2. The features of the claims are not provided with reference signs placed in

parentheses (Rule 6.2(b) PCT).

I CLAIM

1. A rotary apparatus adapted to perform as, compressor, pump, motor, metering device or an internal combustion engine, comprising of two identical vanes, two hollow sleeves, hollow liner, timing devices including cams and associated linkages, couplings/clutch, shaft, and braking/holding arrangement; said cams define a variable initial angular displacement between vanes at the start of sequence, commencing with one vane stationary and other rotating such that on reaching an angle of 360 degrees minus twice the initial angular displacement both vanes rotate together through the said initial angular displacement and the two vanes reach the said initial position with the individual vanes position interchanged, subsequently the previously held vane rotates and previously rotating vane is held stationary until the rotating vane reaches an angle of 360 degrees minus twice the initial angular displacement from the stationary vane and so on continually; said vanes are fitted on to the sleeves, one vane on each sleeve, such that the vanes are radial to sleeve's surface and at one of the ends of each sleeve; said vanes are so fitted that some portion of a vane surface protrudes out of the sleeve's end; said sleeves placed such that their ends fitted with vanes are placed adjacent, with the vanes angularly displaced by a minimum angle which is controlled, varied by said cams; said surfaces where the vanes are attached on the sleeves is such that it allows rotation of the adjacent vanes and sleeve fitting about the said coaxial axis of sleeves; said vanes are placed inside a liner; said liner along with the sleeve surface forms an enclosure ; said liner's inner surface is contoured along the path traced by vane edge while rotating about the said axis, thus allowing rotation of the vanes about the said axis; said vanes divide the said enclosure formed inside the liner into two chambers, characterized by the fact that said two sleeves are coupled and uncoupled with a shaft by means of coupling/ clutching arrangement actuated by cams placed on and, or driven by the sleeves, said braking arrangements actuated by said cams or holding arrangements maintain vanes stationary at a controlled but variable position alternately; said cams define the angle by which the vanes are held stationary, separated, rotated simultaneously or independently; said timing devices allow both vanes to rotate simultaneously through a predefined variable angle resulting in the said apparatus functioning with a variable compression ratio.

2. A rotary apparatus as claimed in claim 1 wherein the said cams have a profile such that the angle that the beginning and end of profile makes to the center line of the cam, defines the, and is equal to the, minimum angle of separation between the vanes during operation and the said minimum angle of separation defines the compression ratio, and the said angle of profile to the center line is gradually varied along the central axis, allowing alteration of the said minimum angle of separation between the vanes during operation by moving cam followers along the central axis through which the said angle of profile is varied, thus resulting in variation of compression ratio.
3. A rotary apparatus as claimed in claim 1 wherein the Sleeve end surfaces adjacent to each other are provided with sealing elements forming a continuous sealing line around said end surfaces blocking a leakage flow.
4. A rotary apparatus as claimed in claim 1 where in said vanes are provided with sealing elements blocking a leakage fluid flow across the vane edges.
5. A rotary apparatus as claimed in claim 1 wherein sealing arrangements placed at the liner and sleeve interface, blocking a leakage flow.
6. A rotary apparatus as claimed in claim 1 wherein communicating devices or flow regulating devices such as ports or valves are provided with, such that the said enclosure is communicated or sealed to spaces outside the enclosure.
7. A rotary apparatus as claimed in claim 6 wherein the communicating device or flow regulating devices such as valves, is so placed, operated and, or timed, such that the apparatus be used as a compressor, motor, pump or a metering device.
8. A rotary apparatus as claimed in claim 7 in which communicating devices and/ or with means of energy addition and removal are provided, so placed, operated and, or timed, such that the apparatus be used as a prime mover like an internal combustion engine with a variable compression ratio.